



United States Environmental Protection Agency  
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January 25, 2006

Mr. Fred Evans  
Engineering Field Activity - North East (EFANE)  
10 Industrial Highway, Code 182/FE - Mail Stop 82  
Lester, PA 19113-2090

Re: *"Quality Assurance Project Plan Addendum for 1,4-Dioxane Ground-Water Investigation at IR Program Site 16"*, dated December 2005 at the Former Davisville Naval Construction Battalion Center (NCBC), Rhode Island

Dear Mr. Evans:

Pursuant to § 7.6 of the Davisville Naval Construction Battalion Center Federal Facility Agreement dated March 23, 1992, as amended (FFA), the Environmental Protection Agency has reviewed the subject document and comments are below:

**GENERAL COMMENTS**

1. The comments provided in this review are based upon knowledge of hydro-geological information available. Specifically, a complete, all encompassing depiction of groundwater flow patterns following the installation of additional groundwater monitoring wells related to the HRC @ injection pilot study was not available. Also previous synoptic groundwater elevation measurements had omitted several key monitoring point locations, primarily several shallow monitoring wells where groundwater was noted to be below the intake of the pump, and was therefore not measured. As such, there is an incomplete picture of groundwater flow patterns at Site 16, especially in the shallower portions of the aquifer.

Additionally, this review did not have available any recent groundwater quality data relative to chlorinated volatile organic compounds (CVOC) from additional monitoring wells installed. Although the release of 1, 4-Dioxane may be unrelated to releases of CVOC, an updated distribution of CVOC concentrations following installation of the additional monitoring wells would be useful in assessing overall likely contaminant release locations.

A major concern is the focus of groundwater quality assessment for 1, 4-Dioxane primarily in the deep portions of the aquifer (7 out of 10 locations); with limited monitoring in the intermediate segment of the aquifer (3 out of 10 locations); and no samples being collected from the shallow portions of the Site 16 aquifer. Although 1, 4-Dioxane can be associated with CVOC it has different physical and chemical characteristics. It is also found as a separate component of paint and varnish strippers. The density of 1, 4-Dioxane is reported to be 1.028 gram per cubic centimeter ( $\text{g/cm}^3$ ) or, essentially the same density of water. By way of comparison, the density of trichloroethylene (TCE)

is 1.468 g/cm<sup>3</sup>. The density of cis 1, 2-dichloroethylene (cis 1, 2- DCE) is 1.274 g/cm<sup>3</sup>. Therefore, while the proposed groundwater sampling intervals might be suitable for CVOC constituents, they do not appear to be appropriate for monitoring of 1, 4-Dioxane. Releases of 1, 4-Dioxane that would have migrated to the groundwater table from one or more potential source areas would more likely be expected to be found in the shallow portions of the aquifer rather than the deep and intermediate intervals. This is especially true unless there were strong downward vertical hydraulic gradients. As such, primacy of groundwater monitoring locations should be on shallow and intermediate intervals of the aquifer for the monitoring of 1, 4-Dioxane. However, since there are relatively few available shallow intervals from which to sample, EPA will recommend a mixed group of sampling intervals.

A second concern relates to the solubility and partitioning coefficient of 1, 4-Dioxane. This chemical is completely soluble in water. The solubility is given as 43,100 milligrams per liter (mg/L). For comparison purposes, the solubility of trichloroethylene (TCE) is 1,100 mg/L and that of cis 1, 2-DCE is 3,500 mg/L. The partitioning coefficient of 1, 4-Dioxane also indicates that it is little retarded in the aquifer. For instance, the organic carbon partitioning coefficient ( $K_{oc}$ ) is given as 3.5 milliliters per gram (ml/g). For TCE and cis 1, 2-DCE, the partitioning coefficients are given as 126 and 49 ml/g, respectively. These properties indicate that if 1, 4-Dioxane has been released at one or more of the site source areas it is likely to have migrated at a much faster velocity than the CVOC constituents. Therefore, while conducting some sampling in the "source" areas (assuming that they have been identified) can be a useful component of the sampling design, it is important to weight the sampling effort to the forward edges of the "plumes" or beyond. That is, 1, 4-Dioxane would be expected to migrate in groundwater much faster than any of the CVOC constituents or degradation products.

While less critical, a third concern is that in Section 8.0, Sampling Process Design, there is reference to "within the plume" and "down gradient from the source." The use of this language and/or designation for sample locations has the potential to be somewhat misleading. It appears that there is more than one "plume" at Site 16, and not one with a universal source as implied by the designations made. There appear to be multiple sources and the plumes emanating from those sources commingle into a site-wide area of CVOC contamination. As an example, the area of the former fire training area and landfill (central portion of Site 16 adjacent to Allen Harbor) is a known, documented source area. However, Table 8-2 calls, for instance, MW16-45D, "within the plume." This location is clearly within a documented source area.

On the other hand, location MW16-39I is called "down gradient from source area MW16-38I." It has not been established that the area of MW16-38I is a source area. Rather, to date, it appears to be an area contaminated by one or more source areas, including from the landfill/fire training area, former Building 41 area, as well as possibly from the railroad spur area in which it is located. Three other proposed sample locations also potentially provide misleading information when they are denoted as being "within CVOC plume." These include MW16-02D, MW16-05D, and MW16-15D. In fact, it has been postulated by the Navy that MW16-15D is actually within a source area (although it is not clear that this has been demonstrated). Contamination at MW16-02D may be from the landfill/fire training area (radial flow, dipping low permeability layers), or from the Building 41 area, railroad spur area, or further up gradient. Nonetheless, the contamination at the three locations noted, do not appear to be from the same, single source.

The sampling locations for 1, 4-Dioxane should be revised to reflect its physical and chemical characteristics, likely pattern of migration in groundwater, and likely points of origin. The first two parameters suggest that monitoring points should be located in the shallow and intermediate intervals of the aquifer and at points some distance down gradient of suspected source areas. While 1, 4-Dioxane may be associated with CVOC it is also a constituent of paint and varnish strippers. Therefore, one location might be assumed to be former maintenance and storage facilities (Building 41 and 42?). Material might also have been disposed within the landfill/fire training area, and also released in the railroad spur area (area suspected of being points of origin for CVOC). A current assessment of groundwater flow patterns, primarily shallow and intermediate groundwater, should be made using updated, current information. EPA is looking forward to the Revised Phase II hydrological data package currently due March 31, 2006.

Therefore, while not all inclusive, monitoring points should include shallow and, if possible, intermediate wells at the three known or suspected source areas: 1.) landfill/fire training area, 2.) just east of the former Building 41 footprint; and 3.) railroad spur area. If samples are limited, priority should be given to sampling from the shallow aquifer. The locations of MW16-45D, MW16-15D are appropriate for the first two locations, except that samples should be collected from the shallow and the intermediate aquifer intervals, not deep as is planned. A third monitoring point should be located in the railroad spur area south of MW16-38I also with sample collection from the shallow and intermediate intervals of the aquifer. Locations designated as MW16-39I, MW16-56I, and MW16-05D may also be used; however, the sampling interval should be at the shallow segment of the aquifer in addition to the intermediate interval. The sample locations MW16-50D and MW16-52D are also acceptable, although samples should be collected from the shallow and intermediate zones of the aquifer.

Of the remaining locations, MW16-10D may be a suitable "up gradient" location although sampling should be conducted from the shallow and intermediate portions of the aquifer. Sampling from the locations of MW16-02D and MW16-38I may be useful, but probably will not provide significant additional information relative to migration of 1, 4-Dioxane and may be eliminated. However, given the potential mobility of 1, 4-Dioxane and the groundwater flow patterns that are understood, to date, two areas are not covered in the monitoring program. The first is to the east of MW16-39I. Because of the solubility and low retardation characteristics of 1, 4-Dioxane, monitoring 500 feet further to the east is warranted. The second area is that of Allen Harbor, itself. The current monitoring is truncated to the north of the landfill/fire training area. A monitoring location should be established west of MW16-52D and north-northeast of MW16-20D along the shoreline of Allen Harbor.

2. EPA understands that this screening level 1,4-Dioxane investigation was to be accomplished using the existing monitoring well network and therefore has revised the list of wells to be sampled keeping the same number of locations. See table below:

Well Number	Justification
MW45I	Fire fighting training area source area with higher hits than shallow well
MW04S	Groundwater discharge area near firefighting training area

MW04I	Groundwater discharge area near firefighting training area –Intermediate level
MW37S	RR spur source area
MW25S	Downgradient of rr spur source area
MW12S	Upgradient shallow well
MW05S	Downgradient plume discharge area
MW05I	Intermediate level plume discharge area
MW23S	Within plume well downgradient of bldg 41 source area
MW59 I	Within plume well to give more geographic coverage than if MW23I were sampled

### SPECIFIC COMMENTS

3. *Page 2-6, Section 2.2, Bullet Comment:* The objective of this monitoring program is not clear from the number, locations, and aquifer intervals of the wells provided. A summary of the rationale for the “pre-selection” of the ten locations should be provided (Table 8-2 is inadequate). As noted in the General Comments above, the physical and chemical characteristics of 1, 4-Dioxane, do not support the development of a groundwater monitoring program focused primarily on the deep aquifer interval. Also, since 1, 4-Dioxane releases, if any, could be different from that of CVOC contaminants, some discussion of their potential origin should be provided to support the monitoring network. Also, this bullet notes that monitoring occurred during the fall of 2004. The results of this first monitoring period should be provided in this document.

4. *Page 2-7, Section 2.3.4:* The documents that are referred to in this section do not provide an updated description of the site hydro-geology. The conceptual site model and information contained in these documents have been commented on by USEPA in various ways. In particular, the nature of the contaminant “plume” versus “plumes” and “source” versus “sources” is a key change. Further, those documents also lack groundwater elevation data, primarily for the shallow aquifer, but also for other intervals to the east of the former Building 41. These issues were to be addressed in follow on hydro-geological work pursuant to preparation of the HRC @ pilot study program. That is, a more complete assessment of CVOC distribution and groundwater flow patterns was to be developed incorporating USEPA concerns. This information was to be submitted subsequent to the 2002 and 2003 Phase II Investigation reports. EPA understands that the Supplemental Phase II RI Data Package due date was recently extended under the FFA from January 16, 2005 to March 31, 2006. The EPA proposal for new sampling locations may change based on review of the information contained in the March 2006 submittal.

5. *Page 6-1, Section 6.1:* This objective for this investigation is in Section 2.2. Please revise the text accordingly.

6. *Page 7-1, Section 7.2:* Although this review did not focus on sampling protocol, etc. it is noted that this section implies that at least 95% of the planned samples to be collected must be valid. This would imply that all 10 would have to be valid. The limited number of samples

leaves no room for less than perfect execution of the sampling program. Provision should be made for additional sample collection.

7. *Page 8-1, Section 8.1, 1<sup>st</sup> Paragraph:* This section states that “representative samples” will be collected. However, as noted in the General Comments, the sampling design does not adequately address the most likely segments of the aquifer to be affected by a release (if any) of 1, 4-Dioxane. The physical and chemical nature of 1, 4-Dioxane indicates that the fate and transport of this constituent in groundwater will be significantly different from that of CVOC such that simply sampling in the “area impacted by CVOC” is not satisfactory unless sampling occurs in the upper portions of the aquifer. Also, the down gradient areas have not been adequately addressed, especially to the east (of MW16-39I) and north-northeast (of MW16-02D) of the several suspected or documented release areas. Therefore, the Sampling Process Design outlined will not collect “representative samples” and does not adequately meet the stated objectives of the program. EPA has proposed a different sampling scheme in this comment letter.

8. *Page 8-1, 2<sup>nd</sup> Paragraph:* The groundwater monitoring locations and intervals outlined in this paragraph are inadequate to address the potential release and distribution of 1, 4-Dioxane in the Site 16 area. As noted in the General Comments, simple assessment in the areas and locations where elevated CVOC were detected is insufficient to evaluate the potential presence, nature and extent of 1, 4-Dioxane. While some 1, 4-Dioxane (if released) may be detected at these locations, the fate and transport of 1, 4-Dioxane is likely to be significantly different than CVOC found at Site 16 (TCE and cis 1, 2-DCE) in that it readily dissolves in water, has a density similar to water (much less than the CVOC constituents present), and has minimal retardation potential, and is not likely to break down in groundwater. Further, the sample locations are not adequately supported relative to groundwater flow patterns and specific documented or suspected source areas. Also, as noted in Specific Comments, the Phase II Investigation reports are incomplete in regard to delineating groundwater flow patterns, especially in the shallow aquifer. The information collected subsequent to those reports should be evaluated prior to finalizing 1, 4-Dioxane sampling locations. EPA may change the proposed new sampling scheme after review of the Navy’s planned March 2006 submittal.

9. *Page 8-4, Table 8-2:* The rationale provided in the table are inadequate. First, as noted in previous comments above, the fate and transport characteristics of 1, 4-Dioxane suggest that it would most likely be detected (if present) in the upper portions of the aquifer, particularly the shallow, water table segment. Collection of samples at depth along where elevated CVOC has been detected is not sufficient justification for sampling at those depths. While sampling may certainly occur at those intervals, it is more important to sample at the shallow and intermediate intervals. There are no shallow groundwater samples in the program and only three intermediate samples.

A further concern is the apparently indiscriminate use of CVOC “plume” and “source” when past investigations have clearly shown multiple likely source areas and more than one plume which may blend into an area of CVOC contamination. Adherence to the single plume and source terminology may inadvertently imply that there is only one source near the former

Building 41 footprint and one plume migrating away from that location. This has not been shown to be the case. This problem appears to be related to lack of incorporation of post Phase II (2003) hydro-geological data and conceptual model formulation.

10. *TetraTech SOP "Groundwater Sample Acquisition and Onsite Water Quality Testing" page 19 of 25* - The criteria for turbidity, specific conductance, ORP, temperature, and pH are different than the criteria in the Region 1 Low Stress (low flow) SOP. Please verify that these criteria have been accepted by EPA and RIDEM. Please clarify in the text, the justification for deviating from the R1 low flow SOP. This QAPP is for 1,4-Dioxane analysis only. If Navy plans on sampling dissolved metals at the NCBC Site at another time, the R1 low flow SOP must be followed with no deviation.

If you have any questions with regard to this letter, please contact me at (617) 918-1384.

Sincerely,



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Remedial Project Manager  
Federal Facilities Superfund Section

cc: Louis Maccrone, RIDEM  
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